IN_LEARNING – TEACHING ARCHITECTURE USING MOODLE

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Abstract

This paper refers to a recent experience of teaching Virtual Reality (VR) technology to Build Environment Visualization (BEV), as part of the Msc program in Architecture at Instituto Superior Técnico (IST). The aim is to assess the potentiality of using the Moodle platform as a higher education blended learning tool. The paper is organized in four parts. The first one approaches the teaching and learning strategies applied in the IST Msc Program. The second one refers to the use of VR technology as part of the training of architecture students. The third one describes the experience of teaching VR to the BEV course, giving evidence to the use of a Moddle1 platform for both collaborative knowledge sharing and course management. The forth part assesses the obtained results. It is concluded that Moddle platform has the ability to support tacit and explicit transfer of knowledge within a hands-on learning environment, allowing architecture students to apply that knowledge with flexibility through discovery and practice.

Keywords: Teaching Virtual Reality, Environment Visualization, Moodle platform.

Resumo

Este artigo refere-se a uma experiência recente do ensino da tecnologia de Realidade Virtual (RV) na disciplina de Modelação Geométrica e Visualização de Edifícios (MGeVE), como parte programa curricular do Mestrado Integrado em Arquitectura no Instituto Superior Técnico (IST). O objectivo do artigo é avaliar a potencialidade do uso da plataforma Moodle como uma ferramenta de aprendizagem combinada, no âmbito do ensino

[1] Moodle (Modular Object-Oriented Dynamic Learning Environment)

superior. O trabalho está organizado em quatro partes. A primeira aborda o ensino e estratégias de aprendizagem aplicada no Mestrado Integrado em Arquitectura no IST. O segundo refere-se ao uso da tecnologia de RV como parte da formação dos estudantes de Arquitectura. O terceiro descreve a experiência no uso da plataforma Moddle, como ferramenta de aprendizagem colaborativa e de gestão da disciplina de MGeVE. A quarta parte avalia os resultados obtidos. Conclui-se que a plataforma Moddle tem a capacidade de suportar a transferência de conhecimento tácito e explícito, no âmbito de um ambiente de aprendizagem hands-on, permitindo a estudantes de arquitectura a aplicação flexível do conhecimento através da descoberta e prática.

Palavras-chave: Ensino de Realidade Virtual, Visualização de Ambientes, Plataforma Moodle.

1 Introduction – Training in Architecture

Society today is dominated by change and uncertainty. We have left behind an age characterized by scientific rationality, stability, control, and capacity for anticipation. In this context, the paradigm of the professional as an individual with a vocation for resolving problems in an instrumental fashion, knowing how to choose the best technical means to respond adequately and effectively to different situations, is outdated.

According to Schön (1983), the great changes that have occurred in the organization of labor have led to great professions, which architecture, being faced with large zones of indeterminate practice, characterized by uncertainty, idiosyncrasy and conflicting values, belongs in. For that reason, the theoretical knowledge obtained through academic training is no longer enough. To deal with the unforeseen, uncertain or new situations, knowledge based on action is needed, as well as reflection on that action.

In the case of architectural practice which revolves around a project, the capacities for action and reasoning interact. Firstly, new knowledge functions as a context on the basis and provides a base for the interpretation of reality. It also determines the emergence of a type of action. Secondly, each action provides new knowledge, which guides the architect in reflections and reasoning. It is therefore this capacity to reflect on action that permits the architect to create and justify his/her own practices.

However, the problem continues when we look at how to teach technology-based knowledge and its subsequent integration into the design, i.e., how to create knowledge through an action and then reflect on that action. We cannot ignore the fact that the answer provided by architectural design is, by definition, always new. The model of training based on transmissible and technically rational practices is neither adequate nor effective. The solution, therefore, lies in training strategies that stimulates

the capacity for reflection; that spurs students to question and seek answers both in theory and practice.

From an interactive perspective, this process can be seen as the inter-relationship between choice and constraint, between individual and institutional factors, in which action and thought inter-penetrate. For the architect, his/her academic training, as well as the concepts developed and the models chosen and discarded over time, play an important role in the formation of his/her identity as a professional faced with different realities (NOGUEIRA et al, 2010).

It is therefore of the greatest importance that the architectural student and future practitioner is able to understand a variety of ways of simultaneously “thinking about” and “acting” before, during and after becoming involved in the profession. The focus is therefore on placing the student in a pedagogical context, which, by virtue of its similarity with a real world context, confronts him/her with complex technical activities and demands informed responses from him/her.

The architect needs a cross disciplinary knowledge, therefore the academic training must support a wide range of practical subjects, as well as grounding theoretical acquaintance of architecture’s contextual relations and its artistic and cultural component. This will enable the future architect to interact with his peers, assimilate and construct knowledge and intervene objectively throughout his career.

This paper aims at describing a recent experience of teaching Virtual Reality (VR) technology to Build Environment Visualization (BEV), as part of the Msc program in Architecture at Instituto Superior Técnico (IST) and assesses the potentiality of using the Moodle platform as a higher education blended learning tool. In the last years, VR technology has been significantly enhanced and increasingly used by design studios, for it supports the professional practice at different scales (urban and building scale). During project conception, this technology enhances critical thinking and enables tridimensional interaction among the professional actors, who acknowledge a conceptual understanding of the object and base their reflections, reasoning and decisions upon their tridimensional visualization. This technological tool leads to a new path in education, enhancing the use of new tools and enabling a new learning process.

The paper is organized in four parts. The first one approaches the teaching and learning strategies applied in the IST Msc Program. The second one refers to the use of VR technology as part of the training of architecture students. The third one describes the experience of teaching VR to the course BEV, giving evidence to the use of a Moddle platform for both collaborative knowledge sharing and course management. The forth part assesses the obtained results. It is concluded that Moddle

platform has the ability to support tacit and explicit transfer of knowledge within a hands-on learning environment, allowing architecture students to apply that knowledge with flexibility through discovery and practice. The study plan is developed around the architecture project and includes the areas of basic sciences, architectural culture and technologies.

2 Virtual Reality and Learning concepts

According to Paulo Freire (1997) learning is a discovery, with openness to risk, adventure and new experiences, because you learn by teaching and when you learn, you are able to teach. The education is a discovery, exploration, observation and knowledge constructive process; VR can transform it in an effective and versatile learning tool. Like in other domains, innovation does not mean replacement, and VR will not replace the existing technology, but it will enhance and complement it (CAMPOS, SAMPAIO, 2005).

According to Vendruscolo et al, (2005), the use of VR in education is a good alternative for teaching, because it expands the usual learning methods; the student is encouraged to participate in the creative fun process, exploring subjects that would take longer to be internalized, if they were taught in the conventional way. Pinho e Kirner (2001) state that there are several reasons to use VR in education:

- Enables student motivation, for it presents new ways of contents visualization;
- Greater illustrative power;
- Promotes an analysis from distinct angles;
- Enables the visualization and exploration of inexistent or difficult access places;
- Extrapolates learning time, usually restricted to the conventional course schedule, allowing the pursuance of educational activities in other places or schedules;
- Integrates students with disabilities, because they can participate in activities, that they wouldn't be able to do otherwise;
- Promotes cooperative learning, because they stimulate shared learning;
- Enables interaction and stimulates active participation.

These possibilities motivated the study of educational applications based upon VR in a low-cost learning environment.

The module combines a face-to-face traditional side, focused on a presentation and a dynamic learner-centered side. The knowledge is transferred based upon demonstration in an informal, active learning environment, the student practices it, promoting the sense of discovery, and understanding is achieved. The goal is to create an environment for applying knowledge, where learners have opportunities for giving meaning to information (SCOTT-WEBBER, 2011).

3 Bev´s goals

One of the main goals of the degree's coordinators is to integrate new technologies in order to improve the students' knowledge. Accordingly, a new module "Virtual Reality technology and visualization" in buildings was added to BEV's course, it intends to present the state of the art of VR technology, computer modulation programs and digital photography enhancement. Throughout the course there's a theoretical framework developed by the courses' administrators. The referred module was structured with face-to-face instruction and computer-mediated instruction (blended learning or b-learning).

The b-learning takes advantage of the strengths of each environment and avoids their weaknesses' (GRAHAM, 2005), making machines and computer interfaces more social and human. The Moodle platform supported the remote learning, stimulating students' reflexive capabilities and providing the means for them to pursuit their research, avoiding procrastination. The face-to-face classes provided a presentation and discussion about a topic, which was further developed with the help of Moodle platform. The class comprised various topics, such as the VR technology, VR systems and its tools, modulation concepts, photographic modulation, laser scanning, satellite images, photography structure, theory and tips, ergonomics, dynamic and static anthropometry, architecture and urbanism panorama, interactive multimedia and 3D modulation.

The evaluation was based on practical exercises, which were based on the face-to-face lectured subjects, supported by the Moodle platform.

The remote learning tool intended to stimulate the students' reflexive capabilities and further research to the lectured subjects. There were several items available in the Moodle platform: classes, tutorials, hyperlinks. The content had direct and concise applications throughout the students' academic and professional life. The intended goal was for the student to actively construct tacit knowledge through dynamic interactions.

4 Methodology

For the elaboration and presentation of theoretical and practical questions in the course, several books, articles and news about VR technology and tools, as well as the Moodle program were investigated.

The field research included several interviews and casual conversations with acknowledged researchers in VR: Professor Marcelo Zuffo, Professor Gerson Cunha, Moodle's system analyst Ricardo Caiado and Jorge Amador and BEV's coordinators: Professor António Leitão and Professor Ana Tomé .

The use of the Moodle tool intended to create a new learning dynamic consistent with the art of conception and design in architecture and urbanism. The future architect has to learn to communicate, and understand his (her) architectonic solution.

The 10 hours module approached VR technology and its tools to build digital tridimensional environments. The sessions were lectured by Professor Aurélio Nogueira and by PhD student Maria Bacharel Carreira, under Professor Teresa Valsassina Heitor guidance.

4.1 Moodle and its host

The BEV course chose Moodle tool to streamline and optimize the management; providing on-line continuous support for active learning, supporting a continuous evaluation to student accesses and promoting users real time interaction.

The Moodle tool enables the creation of several types of users, with different types of access, namely administrator (6 users), professor (2 users), course creator (2 users) and student (62 users – 50 students and 12 guests). Some categories had guests that followed the course development. The six administrators' users correspond to the creators of the module (2), to Professor Cristina G. Tranjan, for eventual technical flaws, for system analysts (2) and for the students' delegate (Nuclear/DECivil/IST), for Moodle's future integration in other students' interactive initiatives. The administrator status enabled the modification of the web-page layout and contents, creation of new classes, gathering of statistical data, creation of new users, among other things.

The Moodle interactive platform was built in the beginning of the course and the content was disclosed on-line conjointly with the face-to-face lessons, so that students would not have to address an excessive amount of information at a time. Overwhelmed students are not productive or clarified.

Moodle, as a support tool for face-to-face classes, mitigates e-learning restrictions, due to the face-to-face support in the classroom. It was acknowledged, that the use of the Moodle tool converts an expositive class in an interactive one, trough interactive share and communication. We set out to gather extra data to obtain the maximum information about the subject.

Figure 1: The Classroom

Moodle enabled forums, chats, file sharing, download of educational material, extra bibliography, related hyperlinks, automatic distribution of news to all its users, activity calendar, visualization of on-line users, search bar on Moodle database, profile update, questionnaires, notes, among others, making the learning and teaching process more efficient. The students have access to presentations, desktop experiments, web-based assignments, and collaborative exercises.

The statistical results based upon these facilities enabled the interpretation, qualification, and improvement of the module, in order to enhance the lectured subjects. We can monitor the accesses in order to know how many access existed, how long they lasted and when they started. It is possible to analyze the general data and acknowledge the most visited topics. It was also possible to know what each user visited and how long he took in each topic.

Relatively, given the number of users for each category the administrators acceded proportionally more times than the students. The administrators log peaks precede the student peaks (data preparation and data visualization) and have similar absolute values. (Figure 2).

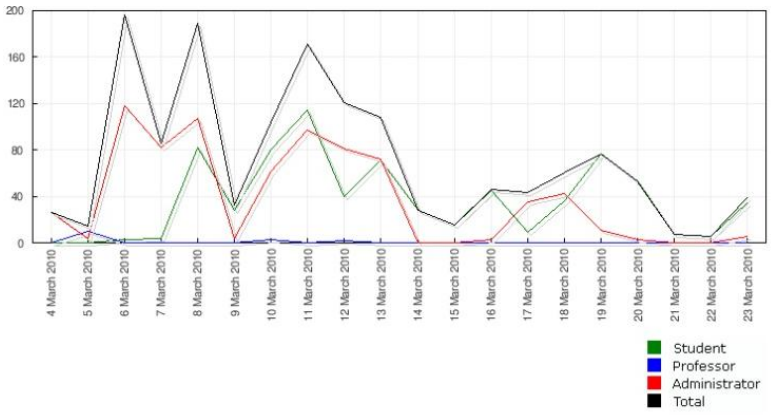

Figure 2: All activities students, professors and administrators (4 weeks)

The students log is not continuous and few access the messages during the 4-week analysis. The maximum peaks, with circa 97 visualizations occurred after the face-to-face class or when an e-mail was sent, letting the students know, that the data was available. The minimums usually matched the weekends. (Figure 3).

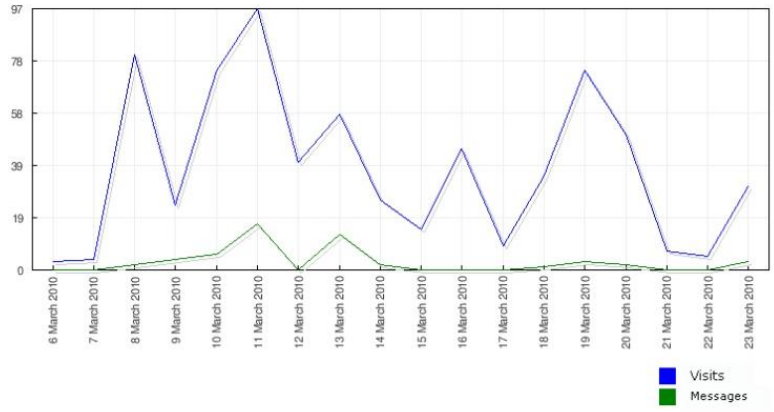

Figure 3: Students visits and messages (4 weeks)

The students' visualizations were asymmetric; the most viewed items were the "News Forum" and "Chat", which stood out from the other items (Figure 4).

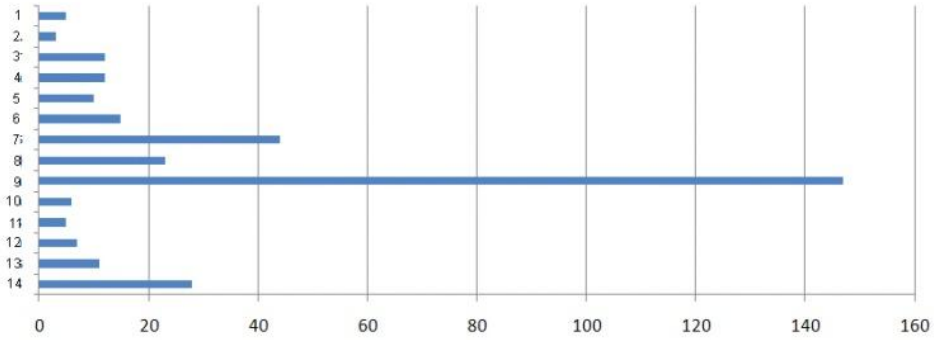

Figure 4: Students' visualizations

Final questionnaire; Thank you! We thank your participation; Exercises to submit; Courses' materials; Class forum; Build your Ninehub; Chat; Questionnaire – Please fill with your personal data; News forum; Courses Goals; Class dynamic; Course evaluation; Bibliographic references and News forum.

We also had the concern to differentiate the origin of the students, in order to know if the access was related with the geographic location. The students were divided in three groups: Lisbon, Lisbon Metropolitan Area (LMA) and other (Figure 5). Most of the students were from Lisbon (62%) or LMA (20%) (total - 82%) and most students from other geographic locations lived at the time in LMA.

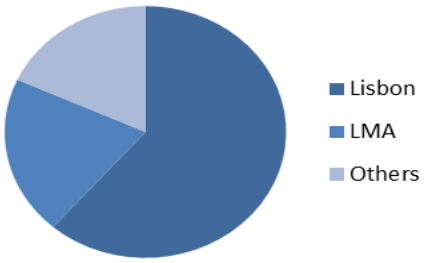

Figure 5: Students' geographic origin

5 Conclusion

The Moodle tool supports the blended learning, for it combines the virtual and face-to-face learning, encouraging individual autonomous learning. It provides data after the class schedule for further research and gathers real-time statistical data of every action and user, allowing a continuous and dynamic contents actualization, supporting students' and teachers' proximity. The expected tendency is for blended learning to prevail, tending eventually to drop the blended word, and becoming the current type of learning.

However, the administrative host constrains condition the platform management, they should be more adaptive according to the teachers' needs. It is not possible to host large and medium size files, due to virtual space availability.

This student centered approach requires internet access and depends on students' time constrains. These restrictions condition the Moodle use. The users' disposition also conditions the use of the platform – only 11 students answered the "Questionnaire – Please fill with your personal data", where the name, nationality and other simple information about the students' academic background was asked, in order to pedagogically adapt the course. Most students did not answer this questionnaire, proving that most non-mandatory tasks are not fulfilled. Most students did not access the tutorials, exercises or the complementary theoretical hyperlinks.

The lack of interest of extracurricular activities is common to most university students, but higher education should demand higher standards. Students' should initiate by themselves further research related to the taught subjects.

The BEV's syllabus enables the development of reflexive capacities. The learning focuses on the methodology and execution of idea transmission, facilitating new architecture communication concepts. The theoretical data provides a contextualization of the students' work, promoting individual research, in order to produce future work in an innovative and engaging way.

The theoretical, practical and experimental articulation aroused interest in a small group of students, in spite of the software simplicity and the positive visual impact of

the final result. Still few students revealed genuine interest about these new tools. The students' lethargy was not engaging and the teacher doubted if the students got the true potential of these tools for their academic life and professional careers.

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